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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/802,084	03/08/2001	Boon Siew Ooi	774-010234-US(PAR)	5341

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EXAMINER

COLEMAN, WILLIAM D

ART UNIT PAPER NUMBER

2823

DATE MAILED: 09/24/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/802,084

Applicant(s)

OOI ET AL.

Examiner

W. David Coleman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 July 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 4, 5, 6, 7, 8 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Burnham et al., U. S. Patent Re. 33,274.

3. Burnham teaches a semiconductor process as claimed.

Pertaining to claim 1, see **FIGS. 1-5**, where Burnham teaches a method of manufacturing a photonic integrated circuit comprising a compound semiconductor structure having a quantum well region 54, comprising the steps of irradiating the structure using a source of photons (i.e., laser, column 2, lines 1-5) to generate defects, the photons having an energy (E) at least that of the displacement energy (E_d) of at least one element of the compound semiconductor, and subsequently annealing the structure to promote quantum well intermixing.

4. Pertaining to claim 4, Burnham teaches a method according to claim 1, in which the radiation source is one selected from a group consisting of electrical gas discharge devices **44**, excimer lasers, synchrotron devices, flash x-ray devices and gamma ray sources.

5. Pertaining to claim 5, Burnham teaches a method according to claim 1, including the step of masking a portion **62** (also see claims 4 and 5) of the structure to control the degree of radiation damage.

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6. Pertaining to claim 6, Burnham teaches a method according to claim 5, in which the mask is adapted to prevent intermixing entirely.

7. Pertaining to claim 7, Burnham teaches a method according to claim 5, in which the structure is masked in a differential manner to selectively intermix the structure in a spatially controlled manner by controlling the exposure of portions of the structure in a predetermined manner (mask 60).

8. Pertaining to claim 8, Burnham teaches a method according to claim 5, in which the mask is selected from a group consisting of binary masks, phase masks, gray, masks, dielectric or metal masks, and photoresist masks.

9. Pertaining to claim 9, Burnham teaches a method according to claim 1, in which spatial control of intermixing is controlled using a variable profile mask pattern.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 2, 3 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burnham U.S. Patent Re. 33,274 as applied to claims 1, 4, 5, 6, 7, 8 and 9 above, and further in view of Thompson et al., U.S. Patent Application Publication No. US 2002/0127752 A1.

12. Burnham discloses a semiconductor process substantially as claimed as discussed above.

Pertaining to claim 2, Burnham fails to teach a method according to claim 1, in which the radiation source is a plasma. Thompson teaches a method wherein the

radiation source is a plasma [0030]. In view of Thompson, it would have been obvious to one of ordinary skill in the art to incorporate the plasma source of Thompson into the Burnham semiconductor process because a first defect layer is grown [0030, lines 17-20].

13. Pertaining to claim 3, Burnham fails to teach a method according to claim 2, in which the plasma source is generated using an electron cyclotron resonance (ECR) system, an inductively coupled plasma (ICP) system, a plasma disk excited by a soft vacuum electron beam, or plasma soft x-ray (SFR) devices. Thompson teaches a method according to claim 2, in which the plasma source is generated using an electron cyclotron resonance (ECR) system, an inductively coupled plasma (ICP) system, a plasma disk excited by a soft vacuum electron beam, or plasma soft x-ray (SFR) devices. In view of Thompson, it would have been obvious to one of ordinary skill in the art to incorporate the process steps of Thompson into the Burnham semiconductor process because a first defect layer is grown [0030, lines 17-20].

14. Pertaining to claim 16, Burnham in view of Thompson fail to teach a method according to claim 1, in which an electron cyclotron resonance system is used to generate a plasma, wherein the microwave power of the ECR system is between 300 and 3000 W, more preferably between 1000 and 2000 W, the process temperature is between 25 and 500⁰ C, more preferably between 25 and 200⁰ C, the process pressure is between 0. 1 and 100 mtorr, more preferably between 20 and 50 mtorr, and the exposure time is between 30 seconds and 1 hour, more preferably between 4 and 14 minutes.

15. Given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved. See *In re*

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Aller, Lacey and Hall (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)

Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

16. Claims 10, 11, 12, 13, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burnham et al., U.S. Patent Re. 33,274 as applied to claims 1 and 4-9 above, and further in view of Poole et al., U.S. Patent 6,027,989 and Feldman et al., U.S. Patent 6,071,652.

17. Pertaining to claim 10, Burnham discloses a semiconductor process substantially as claimed. However, Burnham fails to teach a method according to claim 1 further comprising the steps of forming a photoresist on the structure and differentially exposing regions of the photoresist in a spatially selective manner in dependence on the degree of quantum well intermixing required, and subsequently developing the photoresist. Poole teaches a method of comprising the steps of forming a photoresist on the structure and differentially exposing regions

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of the photoresist in a spatially selective manner in dependence on the degree of quantum well intermixing required, and subsequently developing the photoresist. See **FIG. 7** where Poole teaches the steps of forming a photoresist on the structure and differentially exposing regions of the photoresist in a spatially selective manner in dependence on the degree of quantum well intermixing required, and subsequently developing the photoresist. In view of Poole, it would have been obvious to one of ordinary skill in the art to incorporate the process steps of Poole into the Burnham semiconductor process because by varying the thickness different defect concentrations are created in different regions (column 3, lines 11-12). However, Poole fails to disclose that the mask 12, 14 and 16 above the dielectric is a photoresist. Feldman discloses the use of photoresist. See **FIG. 3**, where Feldman discloses a contact mask with photoresist. In view of Feldman, it would have been obvious to one of ordinary skill in the art to incorporate photoresist into the combined teachings of Burnham and Poole because the photoresist is used to transfer the desired optical element (column 2, lines 41-42).

18. Pertaining to claim 11, the combined teachings discloses a method according to claim 10, comprising the step of applying an optical mask to the photoresist and exposing the photoresist through the optical mask, the optical mask having an optical transmittance that varies in a spatially selective manner.

19. Pertaining to claim 12, the combined teachings discloses a method according to claim 11, in which the optical mask is a Gray scale mask (see title of Feldman).

20. Pertaining to claim 13, the combined teachings discloses a method according to claim 10, in which the photoresist is applied to a masking layer.

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21. Pertaining to claim 14, the combined teachings disclose a method according to claim 13, in which the masking layer is a dielectric.
22. Pertaining to claim 15, the combined teachings disclose a method according to claim 13, further comprising the steps of etching the structure with the developed photoresist in situ to provide a differentially etched masking layer.

Double Patenting

23. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

24. Claim 1 is provisionally rejected under the judicially created doctrine of double patenting over claims 1, 5, 33, 38, 39 and 41 of copending Application No. 09/916,701. This is a provisional double patenting rejection since the conflicting claims have not yet been patented.

The subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that copending application since the referenced copending application and the instant application are claiming common subject matter, as follows: it is well known in the art to substitute ions for photons to cause intermixing of the quantum well for compound semiconductor devices.

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25. Furthermore, there is no apparent reason why applicant would be prevented from presenting claims corresponding to those of the instant application in the other copending application. See *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). See also MPEP § 804.

Conclusion

26. Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. David Coleman whose telephone number is 703-305-0004. The examiner can normally be reached on 9:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7721 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

W. David Coleman
Examiner
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WDC
September 22, 2002

A handwritten signature in dark ink, appearing to read 'W. David Coleman', is written over a horizontal line.